

METALS *and* ALLOYS

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PRODUCTION • FABRICATION • TREATMENT • APPLICATION

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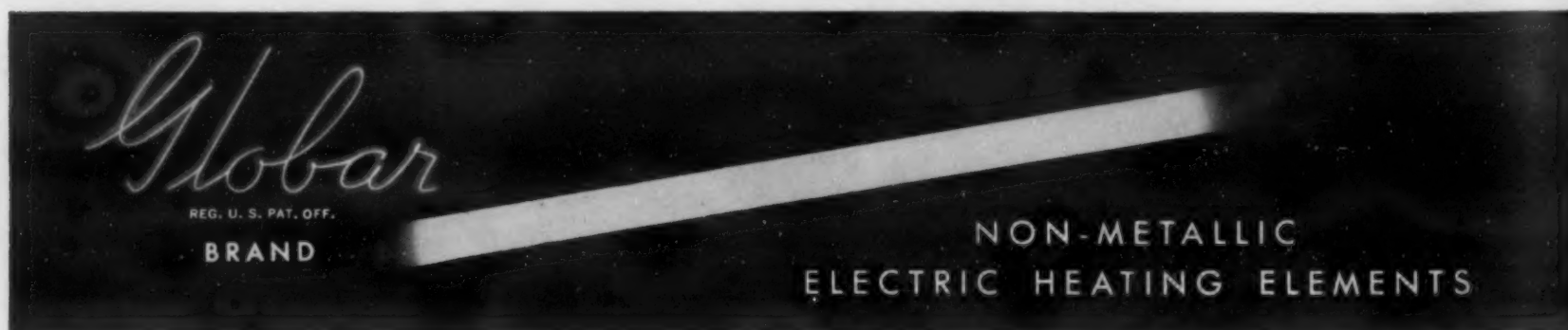
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Highlights

WRITTEN BY THE ABSTRACT SECTION
EDITORS AND THE EDITORIAL STAFF

Do you want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Silver for Brazing

Silver solders are displacing the older brazing brasses, according to Bennett (page MA 422L2). Ag lowers the melting point and insures free-flowing, strong, ductile alloys of better corrosion resistance.—E.F.C.

Building Up Machine Parts

The "Fescol" process for building up worn or undersized metal parts, particularly steel, by nickel plating, is described and discussed by Geiger (page MA 427R7). Hardness may be varied up to 60 scleroscope. Wear resistance is reported high.—E.F.C.

Bright Nickel Plating

Obtaining bright nickel plated deposits is a live subject. Its foreign aspects are reviewed by Springer (page MA 430R3) and the conditions essential to the production of such deposits are discussed. Bright Ni plating baths of recent development usually contain complex aromatic sulphonic acids.—E.F.C.

Save the Surface

Haigh's discussion (page MA 427R10) of failure of wire rope by fatigue, stressing the importance of avoidance of a weak, decarburized surface is quite in line with behavior of springs. Controlled atmospheres for heating high carbon steels by which decarburization may be avoided are badly needed.—H.W.G.

Reinforced Tooth-fillings

Page the silver producers. Reinforcing bars for amalgam fillings are made from silver alloys (page MA 443L7). We suppose re-rolling of thin dimes for this purpose would be against the law. Why not add carborundum or tungsten carbide and make them approximate grinding wheels or tools while we're at it?—H.W.G.

Cherchez la Pointe Curie

Kussman and Schulze (page MA 431L6) suggest that in locating the Curie point the

use of the temperature vs. electrical resistance curve be abandoned in favor of the temperature vs. (low density) magnetization curve.—F.P.P.

Fatigue Agreement

Pomp and Hempel's (page MA 430R8) fatigue test results for screws gives stress concentration factors in good agreement with those of Moore and Henwood for different size threads, according to our section editor.—F.P.P.

Age-hardening

Marie Gayler (page MA 433R4) presents an exhaustive analysis of age-hardening phenomena and offers a new theory that postulates two distinct steps (diffusion and precipitation) in the process.—F.P.P.

Thermal and Electrical Conductivities

Always useful are accurately determined and applicable factors for converting electrical conductivity to thermal conductivity, as determination of the latter directly is an extremely difficult operation. Kempf and Smith (page MA 435L6) have established the Wiedemann-Franz-Lorenz ratio for Al-base alloys of commercial importance between 0° and 400° and have applied their factor in the calculation of the thermal conductivities of a total of 42 Al alloys.—F.P.P.

Die Castings

Die castings of brass are as strong as annealed mild steel, according to Fox (page MA 411L3). Other advantages are discussed.—E.F.C.

Steel Made With No Mn Additions

Wilhelm (page MA 411L6) describes the production in Germany of steel without Mn additions, the product containing only 0.20% Mn. No hot shortness. Steel and plate rolled from this not much different from ordinary steel of this grade.—E.F.C.

Dental Metallurgy

If your *Buccal Mucosa* (whatever that is) is misbehaving, Roome's article (page MA 442R7) may provide enlightenment, tho' probably no relief. Just another example of our unique versatility.—F.P.P.

Flakes

Some theories on flakes in steel are offered by Krutitski and Maslanski (page MA 412R1). Data indicate a connection between flake formation and cooling speed. Susceptibility of a metal to flake formation depends on melting practice. Cooling slower than 15° C. per hr. in the interval between 400 and 150° C. prevents flakes in almost all steels.—E.F.C.

Oxygen in Steel

Another report from the Bureau of Standards on its Comparative Study of Methods for the Determination of Oxygen in Steel (page MA 437L1) has appeared. This is a beautiful example of cooperative activity (34 laboratories are helping) and should be continued.—F.P.P.

Accelerated Corrosion Tests

We wonder if the potentiometric method of predicting the corrodibility of metals described by Guitton (page MA 439L5) will be any more useful than previously developed accelerated corrosion tests, most of which have been found unsafe for service forecasting.—F.P.P.

Corrosion-resistant Symposium

An excellent A.S.M.E. symposium on the use of corrosion resistant alloys in the design of machinery and equipment appears in *Mechanical Engineering*. (page MA 440R8). It is one of those thorough-going compilations that are usually added to the reader's personal file, marked "important."—F.P.P.

Newark's Water Mains

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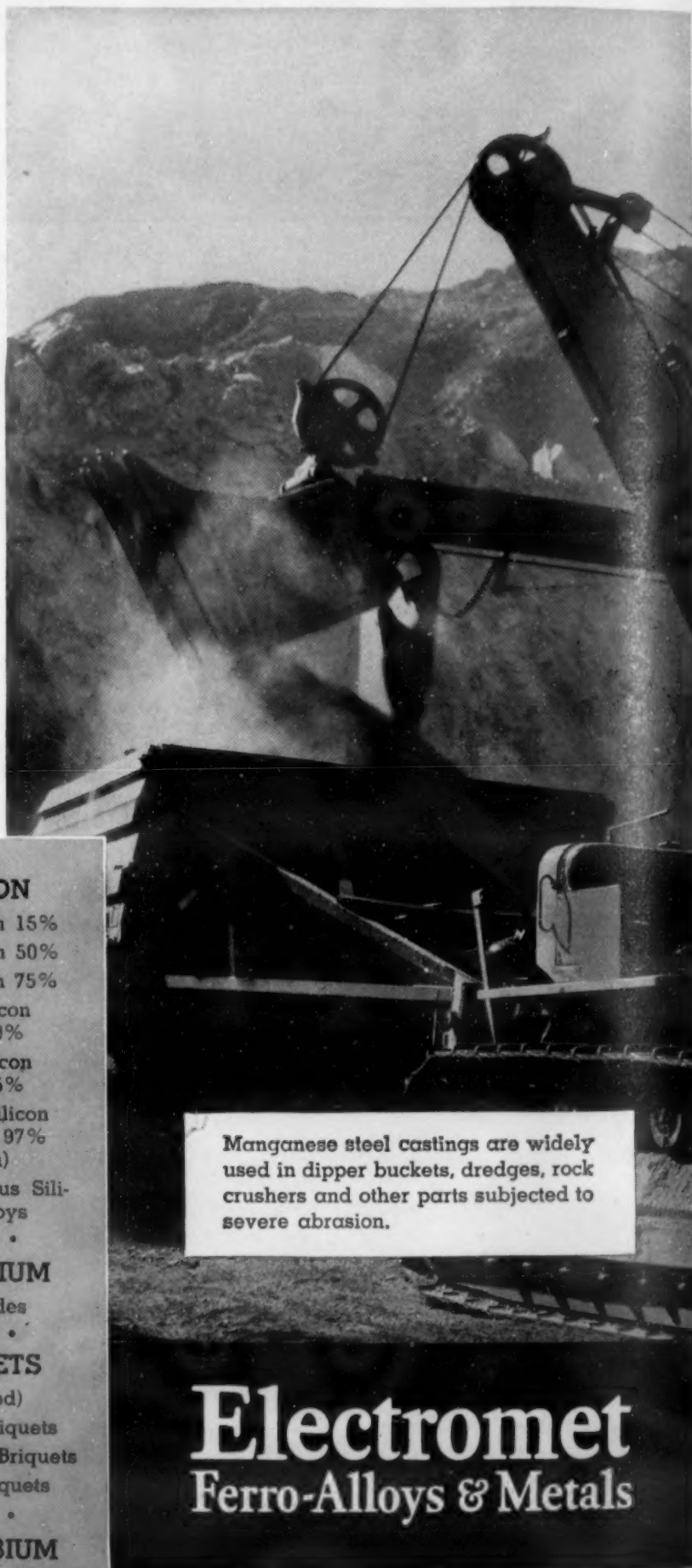
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Chromium Metal

Chromium-Copper

Miscellaneous Chromium Alloys

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Calcium-Aluminum-Silicon

Calcium-Manganese-Silicon

ZIRCONIUM

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35 to 40% Zirconium

Aluminum-Zirconium

SILICO-MANGANESE

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MANGANESE

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Spiegeleisen

Manganese Metal

Manganese-Copper

Miscellaneous Manganese Alloys

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Ferrosilicon 75%

Ferrosilicon 80 to 90%

Ferrosilicon 90 to 95%

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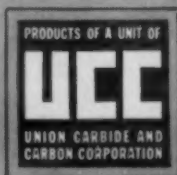
Chrome Briquets

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EDITORIAL

Want to Know!

We get some amusement from scanning abstracts or titles of papers presented to learned societies in fields other than metallurgy, for the light they throw on what different brands of scientists think important enough to study. We are handicapped in our appreciation of these topics because we are so built that we naturally feel that the information sought ought to be of some use to somebody and not merely acquired in order to satisfy purely intellectual curiosity. The physicists' topics often seem weird and wonderful to one with such a point of view. We are a bit more lenient toward the research studies of the medical profession for we feel that the doctors are feeling their way with the definite aim of remedying human ills, even though we often fail to see the direct connection.

We ran across one medical title the other day that interested us, "Distribution of the Taste-Buds on the Kitten Tongue at Birth." We doubt if the catnip growers are fostering the investigation and we are a bit curious as to just what the information is supposed to lead to.

But many of the topics of scientific metallurgy would seem quite as far fetched to workers in other fields, and often to the practical metallurgist.

In METALS AND ALLOYS itself, the editorial staff has often to deal gently but firmly with the publication and advertising staff on the point of allotting suitable space to so-called "high-brow" articles. We grant that quite a proportion of our readers don't care a hoot about the specific details of some such articles and will not take the time to try to follow them. Nevertheless, every such reader rejoices, at least when he stops to think, that there are those who are trying to clear up knotty points of what at the moment may seem like mere theory. They recognize that lots of this sort of work never does get anywhere, but some of it does in the long run, and it is not possible to say with certainty today which article merely starts into a blind alley and which into a future main thoroughfare. Hence, they are glad that metallurgy, along with other sciences, has those who are imbued with the old Yankee spirit of "I want to know!"

It is a bit exasperating to think of the hours of patient toil and the pages of articles necessary before a new fact becomes so well known and so clearly understood and expressed that it can be boiled down to a sentence in a handbook or text book, accepted and utilized by everyone with the sub-conscious feeling "Of course, we always knew that." But many of the "well known" facts of today were but hazily glimpsed and feebly stated in the technical literature of a decade or so ago. Without doubt, many an-

other useful fact is still wrapped in the chrysalis of high-brow articles from which it will later emerge, scarcely recognizable as having once been in its present form.—H. W. G.

Snake Oil

It seems a matter for some degree of pride that while politicians and union racketeers are thriving by working on the assumption that most of the public is either moronic and can't think, being swayed by emotion only, or too lax to think or act, being willing to let the loudest mouthed demagogue lead them, they don't care where, yet the metallurgical industries find it necessary to operate on the basis that the technical people in their own industries and in those to which they sell are neither moronic nor gullible. This is not astonishing, for among technical folk, New Dealers and C.I.O. sympathizers are conspicuous by their absence. The published article, the advertisement, or the metallurgical salesman that takes the attitude of the vendor of cosmetics, cigarettes, or snake oil is almost extinct.

The political administration may be able to get away with the "papa knows best" attitude for the time being, as the dictators of other lands that they ape are doing. But those days are gone from technical fields even though, by and large, it's a moronic world.—H. W. G.

Losses in Processing Stainless Steels

It is generally recognized that one cause of the high cost of rolled products of stainless steels is the waste in reduction from the ingot to the finished product. Some very satisfactory proof of this fact is afforded by an analysis of the production data of the American Iron and Steel Institute on other pages.

These statistics show that the percentage of finished steel products of the total tonnage of ingots of stainless steel is as follows for the last three years:

	Ingots	Rolled Products	Per Cent
1934	49,917	34,079	68.3
1935	65,697	41,799	63.6
1936	90,966	61,365	67.5

The average percentage of finished steel products of the total ingots produced for the last three years is 66.4 per cent. This is by no means a high yield and this condition, supplemented by expensive raw materials and finishing equipment, contributes to the sustained high cost of rolled stainless steel products. Despite this, however, the demand continues to expand.—E. F. C.

It Goes Round and Round

An interesting example of arguing from the specific to the general and repeating the generalities as truth occurs in the history of chromium-molybdenum carburizing steels.

Carburizing experts worked with such steel in '22, '25, and '28 and turned thumbs down on them because of narrow temperature limits in carburizing, lack of core tough-

(Continued on page 190)

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METALS AND ALLOYS

CURRENT Metallurgical Abstracts

A DIGEST OF THE IMPORTANT METALLURGICAL DEVELOPMENTS OF THE WORLD

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CLASSIFICATIONS

1. ORE CONCENTRATION

Crushing, Grinding & Plant Handling (1a), Gravity Concentration (1b), Flotation (1c), Magnetic Separation (1d), Amalgamation, Cyanidation & Leaching (1e).

2. ORE REDUCTION

Non-Ferrous (2a), Ferrous (2b).

3. MELTING, REFINING AND CASTING

Non-Ferrous (3a), Ferrous (3b).

4. WORKING

Rolling (4a), Forging & Extruding (4b), Cold Working, including Shearing, Punching Drawing & Stamping (4c), Machining (4d).

5. HEAT TREATMENT

Annealing (5a), Hardening, Quenching & Drawing (5b), Aging (5c), Malleableizing (5d), Carburizing (5e), Nitriding (5f).

6. FURNACES, REFRACTORIES AND FUELS

7. JOINING

Soldering & Brazing (7a), Welding & Cutting (7b), Riveting (7c).

8. FINISHING

Pickling (8a), Cleaning, including Sand Blasting (8b), Polishing & Grinding (8c), Electroplating (8d), Metallic Coatings other than Electroplating (8e), Non-Metallic Coatings (8f).

9. TESTING

Inspection & Defects, including X-Ray Inspection (9a), Physical & Mechanical Testing (9b), Fatigue Testing (9c), Magnetic Testing (9d), Spectrography (9e).

10. METALLOGRAPHY

11. PROPERTIES OF METALS AND ALLOYS

Non-Ferrous (11a), Ferrous (11b).

12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

13. CORROSION AND WEAR

14. APPLICATION OF METALS AND ALLOYS

Non-Ferrous (14a), Ferrous (14b).

15. GENERAL

Economic (15a), Historical (15b).

1. ORE CONCENTRATION

JOHN ATTWOOD, SECTION EDITOR

Progress Reports—Metallurgical Division. 16. Ore-testing Studies. Introduction. C. W. DAVIS. *U. S. Bur. Mines Rep., Investigations* No. 3328, Feb. 1937, pp. 3-4. **Ore-dressing Tests and Their Significance.** W. F. DIETRICH, A. L. ENGEL & MORRIS GUGGENHEIM. *Ibid.*, pp. 5-35. Preliminary investigations, consisting of the following, are described: Crushing, sampling, sizing, float- and sink-testing, microscopic study, magnetic tests, heat treatment, agglomeration, and explosive shattering. The equipment and procedure for gravity-concentration and magnetic-concentration tests are described. Flotation testing is discussed in great detail including dry versus wet grinding, flint versus steel balls, water supply, pulp density, soluble salts and colloids, continuous versus batch grinding, correlation of gravity or magnetic tests with flotation tests, selection of reagents, quantities of reagents and manner of introduction, open-circuit batch tests, closed-circuit batch tests, closed-circuit continuous tests, grinding equipment and procedure, flotation equipment and procedure, and factors influencing the choice of flotation testing methods. **Reports of Tests.** C. W. DAVIS & STAFF OF THE ORE DRESSING SECTION. *Ibid.*, pp. 51-150. Results of tests on 1 Sb, 1 Cr, 1 fluor spar, 7 Au, 5 Au-Ag, 1 Au-Ag-barite, 1 Au-Ag-Cu, 1 Au-W, 2 Li, 1 Mo-Pb, 1 Ag-Pb, 2 Ti, 1 W slime, 1 V, 1 Zn, and 1 Zn-Pb ores are reported with recommendations as to treatment to be used. AHE (1)

Present Tendencies in Iron Ore Preparation. A. J. GLEASON (Pickands, Mather & Co.) *Mining Congr. J.*, Vol. 23, Jan. 1937, pp. 60-63. Crushing to max. 3 to 8 in. size is the most widely used preparatory method. Some washing plants crush to $\frac{3}{4}$ to 2 in. max. size. Sandy ore is washed to remove sandy fines; a small quantity of ore is also jigged to remove coarse gangue. Ore of high moisture content is sometimes roasted to eliminate water and to improve smelting properties. Many furnace operators are of the opinion that the demand for better steel may force Fe ore producers to crush their ores to some limiting size; which size will depend on the way the ore reduces in the furnace, and then screen out the fine ore to be agglomerated, so that no fine material will enter the furnace and cause channeling and excessive flue dust. Sampling and screening are discussed, and data are given on porosity and decrepitation tests, to indicate the factors that will have to be considered if such a program is undertaken. BHS (1)

Gold Ore from Duparquet Mining Company, Limited, Duparquet, Quebec. W. B. TIMM *et al.* *Can. Dept. Mines, Mines Branch*, Rept. No. 7

2. ORE REDUCTION

A. H. EMERY, SECTION EDITOR

2a. Non-Ferrous

Copper Refining in Converters. T. W. CAVERS & G. M. LEE. *Trans. Can. Inst. Mining Met.*, Vol. 40, Jan. 1937, pp. 5-10; *Can. Mining Met. Bull.* No. 291. General. From Cu containing Cu 99.25%, Au 0.5 oz. and Ag 25 oz., Cu assaying as follows was obtained: Cu 99.86% (remelting and poling gave Cu 99.923%), Au 0.009 oz. and Ag 4.30 oz. Costs were less than 0.2 cents/lb. AHE (2a)

Filtration of White Mud at the Tikhvin Aluminum Plant. E. S. SHAPIRO. *Legkie Metal.*, Vol. 5, July 1936, pp. 18-20. In Russian. Substitution of decantation for filtration is recommended. HWR (2a)

Production of Aluminum Alloys in a Laboratory Blast Furnace. D. I. LISOVSKII. *Legkie Metal.*, Vol. 5, June 1936, pp. 53-63. In Russian. Bauxite, coke, and Na_2CO_3 were charged into a small furnace (900 mm. high) using O blast. The alloy obtained contained 78-92% Fe, 1.23-12.04% Si and 2.74-9.02% Al. Higher Al content could not be secured because it was impossible to produce a high enough temperature in such a small furnace. HWR (2a)

Reactions in the $\text{Al}_2\text{O}_3\text{-Fe}_2\text{O}_3\text{-SiO}_2\text{-Na}_2\text{CO}_3$ system. V. A. MAZEL. *Legkie Metal.*, Vol. 5, June 1936, pp. 42-52. In Russian. From mixtures of Al_2O_3 , SiO_2 , and Na_2CO_3 and of Al_2O_3 , Fe_2O_3 , SiO_2 , and Na_2CO_3 , $\text{Na}_2\text{O}\cdot\text{SiO}_2$ and $\text{Fe}_2\text{O}_3\cdot\text{Na}_2\text{O}$ were formed. At 800° C. $\text{Na}_2\text{O}\cdot\text{Al}_2\text{O}_3$ is formed only when an excess of Na_2O is present. At 1200° C. $\text{Na}_2\text{O}\cdot\text{Al}_2\text{O}_3$, $\text{Na}_2\text{O}\cdot\text{Fe}_2\text{O}_3$, and $\text{Na}_2\text{O}\cdot\text{Al}_2\text{O}_3\cdot 2\text{SiO}_2$ are formed. These form solid solutions which are insoluble in hot H_2O . HWR (2a)

The Thermal Dissociation of Nickel Sulphide. J. I. GERASIMOW, N. I. PIRZHALOV & V. V. STEPIN. *Zhur. Obshey Khim.*, Vol. 6, No. 11, 1936, pp. 1736-1743. In Russian. Original research. Dissociation pressure is constant during change of chemical composition of solid phase from NiS to $\text{NiS}_{1.37}$, but sharply increases in the range $\text{NiS}_{1.37}$ to $\text{NiS}_{1.44}$. The existence of the compound NiS_2 is suggested. NA (2a)

2b. Ferrous

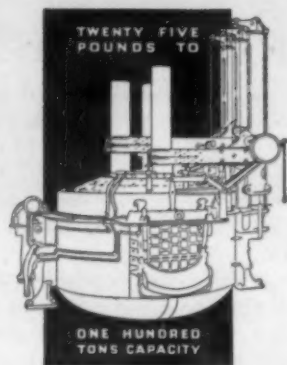
Blowing-in Solid and Fluid Substances to Overcome Blast Furnace Scaffolding (Das Einblasen von festen und flüssigen Stoffen in das Hochofengestell) R. KRIEDE & J. ROLL. *Stahl und Eisen*, Vol. 56, Sept. 24, 1936, pages 1177-1179. Blowing-in ferrosilicon failed because of local temperature drop and slagging at tuyeres. Tar or petroleum were somewhat better. Blowing-in sand beneath the tuyeres helped correct variations in slag composition and was successful in avoiding scaffolding in an extended campaign. SE (2b)

Study of a Direct Method of Stainless Steel Production. R. P. FORSYTH. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Aug. 1936, pp. 94-95. Discussion. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 133R/9. AHE (2b)

Carbon in Pig Iron. WILLIAM E. BREWSTER. *Steel*, Vol. 98, Feb. 24, 1936, pp. 55-56. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 70R/8. MS (2b)

Sintering Plant Improves Blast Furnace Practice in South. M. F. MORGAN. *Steel*, Vol. 100, Feb. 8, 1937, pp. 60-61. Completion of Fe-ore sintering plant at Thomas, Ala., blast-furnace of Republic Steel Corp. has reduced fuel ratio and increased tonnage of Fe produced. Ore fines are mixed with an equal volume of blast furnace flue-dust and sintered. Furnace charge averages 70% crushed ore containing 32.30% Fe and 30% sinter containing 44% Fe. MS (2b)

"Scab" 8 Feet Thick Blasted Off Inner Lining While Furnace Is Operating. *Steel*, Vol. 1



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3a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

1

Recovery of Selenium and Tellurium. J. F. WHITE (Can. Ind. Ltd.) *Can. Chem. Met.*, Vol. 21, Feb. 1937, p. 46. Practice at the Canadian Copper Refineries plant in Montreal East, Canada for the recovery of Se and Te. Blister Cu and anode Cu (from the Hudson Bay and Noranda smelters) carry .2-.25% of Se and Te, present as selenides and tellurides. In the tank house, they separate to the slimes along with the Cu, Au, Ag, etc. The dried slimes are acid roasted to remove much of the Se as oxide to the scrubber and make the Au soluble as sulphate. Te is oxidized largely to the tellurite. The "roasted slimes" are given a water leach to remove Cu, then mixed with soda ash, NaOH and sodium silicate and charged to the Doré furnace. Here more Se is fused off as oxide; a No. 1 slag is removed and returned to the smelters, a No. 2 slag containing Te (and some Se) as the tellurite and tellurate is removed and the Doré metal containing the Au and Ag is removed. Au and Ag are separated in Moebius cells. The slag is water leached and the filtered solution is combined with the acid solution of the scrubber system. This operation yields a "neutralized mud" containing most of the Te and some Se and a "neutralized slag leach" high in Se and low in Te. The "neutralized mud" is given a water leach to remove Na salts. The residue is mixed with H₂SO₄ and roasted in a furnace. The Se is mostly roasted off and the Cu made soluble. The Cu is leached out and the residue is given an acid leach. This leach is treated with Na₂SO₃ to complete the removal of Se, NaCl is added and the solution gassed with SO₂ and the precipitated Te dried and cast with a resultant purity of 99.5%. WHB (3a)

2

4

Recent Developments in Light Metal Ingot and Billet Casting (Neuere Entwicklungsrichtung im Block-und Barrenguss von Leichtmetall) H. RÖHRIG (Lautawerk N.L.) *Aluminium*, Vol. 19, Feb. 1937, pp. 51-53; Discussion pp. 70-71. Modern casting methods that improve the uniformity of the casting and prevent the casting skin from entering the casting are briefly reviewed. The tilting mold, the dropping mold, molds without bottom, and the Hazlett casting process are described; in the last the metal is cast between two rolls provided with lateral flanges, the metal solidifies before the slot between the roll with an extremely rapid cooling so that the disadvantages of slow cooling, aggregations of intermetallic compounds or the occurrence of orientated transcrystallization structures, or pipes, are eliminated. 4 references.

3b. Ferrous

C. H. HERTY, SECTION EDITOR

Possible Causes of Lack of Fluidity in Steel. R. H. GREAVES. *Iron & Coal Trades Review*, Vol. 133, Dec. 4, 1936, page 974. While viscosity is concerned with movements in the interior of a liquid, the reciprocal value of the coefficient of viscosity is defined as coefficient of liquidity or fluidity. Literature and experiments in this field are reviewed. P reduced fluidity, Mn increased it slightly, Si somewhat more, and S as MnS to a greater extent. True viscosity of steel is only a small multiple of that of water, and the kinetic viscosity considerably lower. The fluidity is influenced by surface tension of steel and mold sand, to some degree by the composition of the steel and by inclusions. Ha (3b)

Advantages of Brass Die Castings. J. C. FOX. *Modern Machine Shop*, Vol. 9, Dec. 1936, pages 56-64. Die, or rather "pressure," castings of brass are as strong as annealed mild steel, and may be produced more rapidly than sand castings and more accurately than ordinary castings or forgings. Suitable brasses and their mechanical properties listed. For good castings, the die-material must be specially selected. Ha (3b)

Research on Cast Iron. *Engineering*, Vol. 142, Nov. 13, 1936, page 527. Brief summary of the researches outlined in the Fifteenth Annual Report of the British Cast Iron Research Association. LFM (3b)

Steel Castings for the Electrical and Allied Industries. *Electrical Review*, Vol. 119, Nov. 6, 1936, pages 637-638. Brief description of the steel foundry of Messrs. Kryn & Lohy, Ltd., Letchworth, Eng. Very low C steel is produced in side-blown acid-lined converters fed by cupolas. Typical permeability curve is presented. MS (3b)

Steel Castings. *Times [London] Trade & Engineering*, New Series, Vol. 40, Nov. 1936, page 34. Deals with improvement in steel castings, essentials for production of good castings, effect of alloying elements, and applications. MS (3b)

Adopts Randupson Process for Making Ingot Molds. E. A. FRANCE, JR. *Steel*, Vol. 99, Nov. 16, 1936, pages 65, 67. Describes process used by Vulcan Mold & Iron Co., Latrobe, Pa. MS (3b)

Elliptical Shape Welded Steel Ladle Handles Large Tonnage of Hot Metal. *Steel*, Vol. 99, Nov. 2, 1936, page 73. Welded steel ladle weighing 31,000 lbs. and holding 120 tons of molten steel replaced older design weighing 55,000 lbs. and holding only 100 tons of hot metal. By making horizontal cross-sections elliptical rather than circular, capacity was increased without increasing height and without lengthening distance between trunnions.

MS (3b)

Salt Coating on Ingot Molds Tends To Prevent Stickers and Scale. *Steel*, Vol. 99, Oct. 19, 1936, page 55. By dipping hot ingot-molds into a tank of NaCl brine, scale on molds is removed, and its formation is prevented. NaCl coating helps to prevent steel from sticking to sides of mold. Apparently, whether or not saturated brine is used makes little difference. Most effective temperature for dipping molds is about 500° F.

MS (3b)

Microscopic Investigation of Processes of Dendritic Crystallization. B. E. VOLOVİK & N. I. YASIRKINA. *Metallurg*, Vol. 11, Oct. 1936, pages 27-34. In Russian. Crystallization of aqueous solutions of salts and of camphor were investigated under a microscope in order to illustrate probable behavior of crystals of steel on solidification.

(3b)

Effect of Temperature upon Interaction of Gases with Liquid Steel. JOHN CHIPMAN & A. M. SAMARIN. *Metals Technology*, Jan. 1937, *American Institute Mining & Metallurgical Engineers, Technical Publication No. 784*, 15 pages. Previous work has established the conditions of equilibrium in reactions of liquid Fe with steam at 1600° C. and with oxides of C at 1580° C. An experimental study was made, covering the range 1600 to 1770° C., of the reaction: $\text{FeO}(\text{in Fe}) + \text{H}_2 = \text{Fe}(\text{liq.}) + \text{H}_2\text{O}(\text{g.})$; $K = (\text{H}_2\text{O})/(\text{H}_2)(\% \text{FeO})$. At 1700° C. O content of Fe is proportional to steam/ H_2 ratio in the gas, confirming results of previous investigations. The equilibrium constant is therefore independent of FeO content and is a function of temperature only. Experimental data are represented by: $\log K = 10, 200/T - 5.50$. In order to apply experimental results to reactions



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4. WORKING

Some Aspects of a Study of Steel Tubes. J. W. JENKIN. *Proc. Staffordshire Iron Steel Inst.*, Vol. 51, 1935-1936, pp. 91-95. See *Metals and Alloys*, Vol. 7, July 1936, p. MA 345L/4. GTM (4)

Cold Rolling and Cold Pressing. J. W. BERRY (Stourbridge Rolling Mills) *Proc. Staffordshire Iron Steel Inst.*, 1935-36, Vol. 51, pp. 22-41; discussion pp. 42-50. Comprehensive survey. See *Metals and Alloys*, Vol. 7, Apr. 1936, p. MA 182L/5. GTM (4)

4a. Rolling

S. EPSTEIN, SECTION EDITOR

Strip Mill Motors and Generators Cooled by Heat Exchanger Units. *Steel*, Vol. 100, Mar. 1, 1937, p. 66. Brief description of installation at hot wide-strip mill of Carnegie-Illinois Steel Corp., Gary, Ind. MS (4a)

Armco Completes Cold Reduction Mill. *Iron Age*, Vol. 139, Jan. 21, 1937, pp. 28-30. Describes new cold reduction mill of the American Rolling Mill Co. This also involved the widening of its hot strip mill and the expansion of certain other processes. The maximum width of coils rolled is 74 in. and the average gage is 0.090 in. VSP (4a)

4b. Forging & Extruding

A. W. DEMMLER, SECTION EDITOR

Modern Forging Practice Is Well Integrated Technique. R. W. THOMPSON. *Steel*, Vol. 100, Feb. 8, 1937, pp. 42-44, 46-47. Discusses design of drop forgings, forging equipment, steels for die-blocks and for upsetter operations, and control of furnaces. Automobile has contributed most to advancement of drop forging. MS (4b)

New Type of Forging Equipment. *Heat Treating Forging*, Vol. 23, Feb. 1937, pp. 79-80. Warren Tool Co., Warren, O., has mechanism consisting of a furnace through which bars are conveyed to transfer-fingers which lift bars 1 at a time to a press, where they are successively moved forward and subjected to 6 forming operations, after which they slide into a tote-box. MS (4b)

4c. Cold Working — Shearing, Punching, Drawing & Stamping

The Metallurgical Aspects of Deep Drawing. J. D. DEVONS. *Iron Steel Ind.*, Vol. 9, April 1936, pp. 235-238; May 1936, pp. 277-282; July 1936, pp. 419-424; Sept. 1936, pp. 483-490; Nov. 1936, pp. 135-142; Dec. 1936, pp. 191-193. Unusually comprehensive review, under the headings: improvements in quality of metal during the past decade, failures and defects encountered during deep drawing, the nature and specification of desirable qualities in deep drawing metal, and a forecast of possible and desirable improvements in the metal and practice. CMS (4c)

Shearing Strip at High Speed. H. H. TALBOT. *Blast Furnace Steel Plant*, Vol. 24, July 1936, pp. 591-592. Flying Shears Have Many Applications in Modern Mills. *Steel*, Vol. 98, June 29, 1936, pp. 57-58, 61. See *Metals and Alloys*, Vol. 7, Nov. 1936, p. MA 530R/7. MS (4c)

4d. Machining

H. W. GRAHAM, SECTION EDITOR

The Use of Hard-metal Tools in the Chemical Industry (Die Verwendung von Hartmetallwerkzeugen in der chemischen Industrie) KARL BECKER. *Chem. App.*, Vol. 24, Feb. 10, 1937, pp. 33-35. Hard metals made in Germany, especially for working metals, vitreous and clay products are reviewed. All materials are made of sintered alloys consisting mainly of tungsten carbide, sometimes with additions of Co and titanium carbide. A selection of tools is illustrated. 4 references. HR (4d)

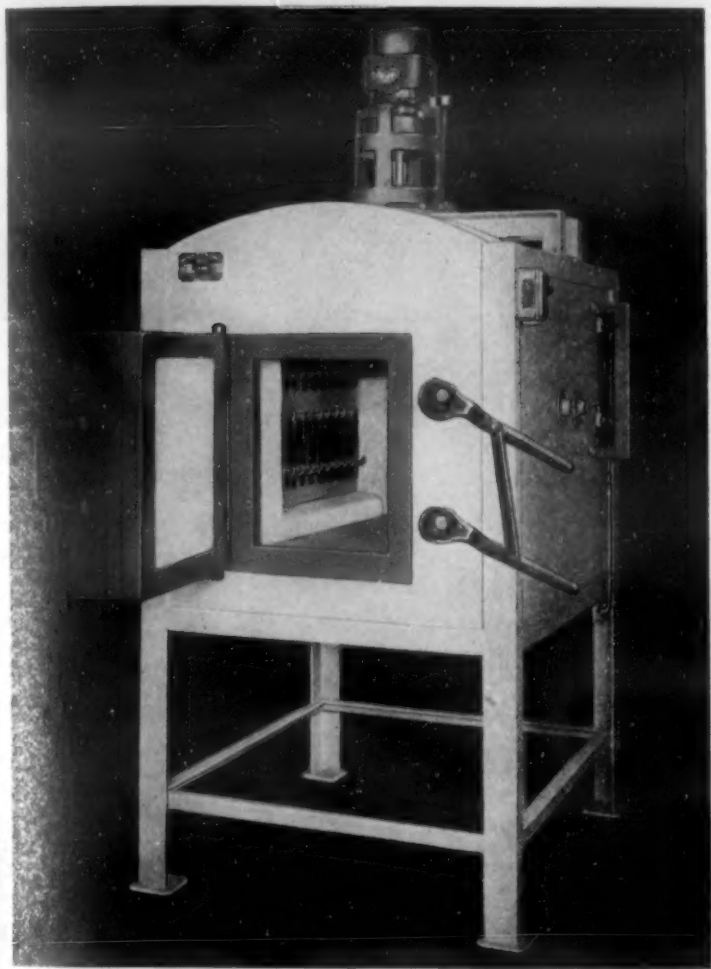
5. HEAT TREATMENT

O. E. HARDER, SECTION EDITOR

Controlled Heat Treating of Small Parts. H. P. BRISTOL (Bristol Co.). *Heat Treating Forging*, Vol. 23, Mar. 1937, pp. 115-117. Describes heat treating department of the Bristol Co. MS (5)

Heat Treatment as It Affects the Designer. Part I. GUY HUBBARD. *Machine Design*, Vol. 9, Mar. 1937, pp. 29-32; Part II, Apr. 1937, pp. 26-28. General. Gives some metallurgical aspects about which "machine designers in general should be informed." Discusses some practical examples requiring a close cooperation between metallurgist and designer. EF (5)

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6. FURNACES, REFRACTORIES AND FUELS

M. H. MAWHINNEY, SECTION EDITOR

Melting Furnaces for Light Metals (Leichtmetallschmelzöfen) FR. KNOOPS. *Elektrizitätswirtschaft*, Vol. 35, Sept. 25, 1936, pp. 710-712. A short review of a few German furnace types. EF (6)

The Significance of Electric Heat for the Improvement of the Quality of Metallic Materials (Die Bedeutung der Elektrowärme für die Werkstoffveredlung) O. DAHL. *Elektrizitätswirtschaft*, Vol. 35, June 25, 1936, pp. 465-468; July 15, 1936, pp. 529-532. Up-to-date review. EF (6)

Furnace Pressure and Temperature Control for Side Door Heating Furnaces. MARTIN J. CONWAY (Lukens Steel Co., Coatesville, Pa.). *Iron Steel Eng.*, Vol. 14, Apr. 1937, pp. 30-34; *Ind. Heating*, Vol. 4 Apr. 1937, pp. 296-308, 315-316; *Blast Furnace Steel Plant*, Vol. 25, Mar. 1937, pp. 303-306; *Heat Treating Forging*, Vol. 23, Apr. 1937, pp. 196-199. *Iron Age*, Vol. 139, Apr. 15, 1937, pp. 34-39. **Automatically Controlled Heating Furnace Increases Metallic Yield by 1 Per Cent.** *Steel*, Vol. 100, Mar. 22, 1937, pp. 38-40, 66. Conditions inside and outside the furnace in their bearing on measurement and control of fuel flow, burner arrangement, combustion, output, and economies in recent design are discussed at length. Recuperative furnaces were found to be superior to regenerative furnaces.

WLC + Ha + MS + VSP (6)

Development of Radiant-tube Heating for Industrial Furnaces. W. M. HEPBURN (Surface Combustion Corp.). *Machinery*, N. Y., Vol. 43, Feb. 1937, pp. 373-374. Brief review and description of recent progress. Ha (6)

Modern Annealing Plant for a Continuous Mill. A. L. HOLLINGER & H. C. WELLER (Surface Combustion Corp.). *Metal Progress*, Vol. 31, Apr. 1937, pp. 389-395. Descriptive. WLC (6)

Improvements in Sheet Annealing Furnaces (Perfectionnements aux Fours de Recuit des Tôles) CHARLES HEURTEY. *Rev. Met.*, Vol. 34, Feb. 1937, pp. 161-165. A brief description of some present furnaces. JDG (6)

Recent Developments in Refractories. CHRISTOPHER E. MOORE. *Proc. Staffordshire Iron Steel Inst.*, Vol. 51, 1935-36, pp. 74-84; discussion, pp. 84-90. Review of developments in the production of fire bricks and other special refractory materials. GTM (6)

Oil Fired Heat Furnaces. YOSHIJIRÔ GO (Japan Steel Tube Co.). *Tetsu-to-Hagane*, Vol. 23, Mar. 25, 1937, pp. 284-288. In Japanese. Descriptive of the nature of oil used in heating furnace, its handling, and firing arrangement adopted by Japan Steel Tube Co. NS (6)

Selection of most Suitable Resistor Material in Electrical Furnaces (Wahl geeigneter Baustoffe in elektrischen Widerstandsöfen) WILHELM FISCHER. *Elektrizitätswirtschaft*, Vol. 35, Sept. 25, 1936, pp. 701-702. Superficial comparison of Ni-Cr, Fe-Cr, Al and Si-C as resistor materials. EF (6)

Heat Treatment of Light Metals (Vergüten und Veredeln der Leichtmetalle) FR. KNOOPS. *Elektrizitätswirtschaft*, Vol. 35, Oct. 15, 1936, pp. 750-752. Descriptive. 7 out of 8 illustrations show furnace types used in German practice for heat treating Al alloys. EF (6)

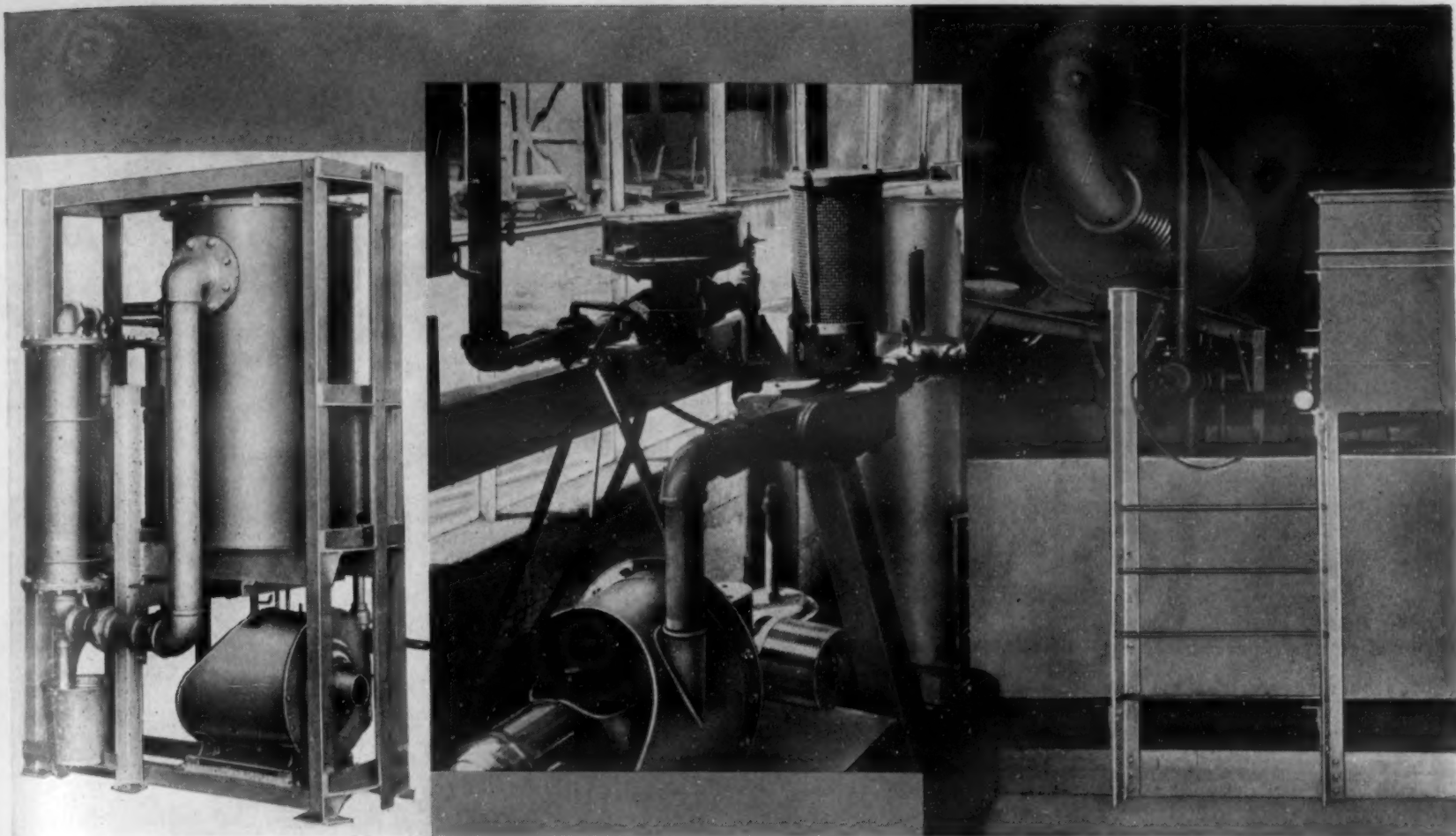
Backing Up Refractories with Insulating Material. G. E. GRIMSHAW (Johns-Manville). *Steel*, Vol. 100, Apr. 12, 1937, pp. 89-90, 92, 94; Apr. 19, 1937, pp. 51, 54, 56, 59. Describes insulating materials used, important physical and thermal properties and methods of testing, and discusses selection of proper material and economical thickness. Includes tables and charts. MS (6)

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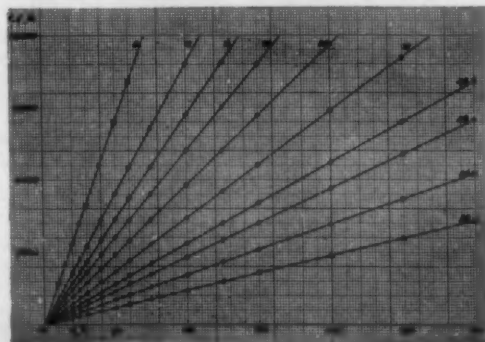
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7. JOINING

7a. Soldering & Brazing

C. H. CHATFIELD, SECTION EDITOR

The Use of Silver in Modern Brazing. HERBERT E. BENNETT. *Metal Treatment*, Vol. 2, Autumn 1936, pp. 130-131. Ag solders are replacing the older brazing brasses, the Ag additions lowering the melting point and giving free-flowing, strong, ductile alloys of improved corrosion resistance. "Sil-fos" is an alloy of Cu with 15% Ag and a small amount of P. It melts at 705° C., is free flowing, and needs little flux. Ag solders containing Mn are used with stainless steel. JCC (7a)

Use of Silver Solders. R. H. LEACH. *Sheet Metal Ind.*, Vol. 10, Dec. 1936, pp. 969-970. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 154L/1. AWM (7a)

Fluxes for Use in Soft-soldering. J. W. WILLSTROP, A. J. SIDERY, & H. SUTTON. *Sheet Metal Ind.*, Vol. 10, Oct. 1936, pp. 779-780. *Chem. Trade J.*, Vol. 99, Sept. 18, 1936, p. 231. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 152R/8. AWM + MS (7a)

7b. Welding & Cutting

E. V. DAVID, SECTION EDITOR

Electric Welding at the Works of Robey & Co., Ltd., Lincoln. *Welder*, Vol. 8, Nov. 1936, pp. 1134-1136. Descriptive survey, with photos of equipment welded, of application of welding in plant which has used the method of construction for 22 years. Much of the work requires flanging after welding and failure during bending does not occur. WB (7b)

Multi-cylinder Portable Welding Sets. *Welder*, Vol. 8, Nov. 1936, pp. 1131-1133. Descriptive of new Murex welders of welded construction. WB (7b)

How Design for Welding Defers Obsolescence and Increases Profits for Manufacturers and Users of Metal Products. ERICK OBERG, (Machinery, N. Y.) *Intern. Acetylene Assoc.*, Nov. 1936, 16 p. preprint. Review of advantages in welding and flame cutting for machinery construction due to flexibility of the processes and design. Development of flame cutting has enabled production schedules to be speeded up and large savings to be made. Ideal sections with lowest weight to carry a load or greater rigidity are most easily fabricated by welding, which in a casting would require complicated core work, etc. Other favorable comparisons are made and discussed. Weld designer must design on basis of yield strength of weld metal in many cases and for shock resistance in large power machinery. Repair and hard facing by welding are briefly referred to. WB (7b)

Structural Changes of Mild Steel During Welding and their Effect upon the Strength of Ship Members (Gefügeänderungen des Flussstahles beim Schweißen und deren Einfluss auf die Festigkeit der Schiffsverbände) A. J. MLADIATA. *Werft, Reederei u. Hafen*, Vol. 17, Dec. 15, 1936, pp. 401-402. Due to considerable local overheating during arc welding, structural changes take place which materially affect the dynamic resistance of structural steels used in ship building. The tightness of joints due to shrinkage stresses and high-seas pounding was impaired. Impact and tensile tests were carried out on mild steel samples welded with electrodes containing .009 C, .35 Mn, .17 Si and .03% P. EF (7b)

Electric Welding Cast Iron. C. D. MCFALLS. *Ind. & Welding*, Vol. 10, Mar. 1937, pp. 17-18. Brief review of practical details for successful welding. Low C (.06% max.) coated rod is considered best, C arc successful if properly handled, steel electrode poor practice due to hardened areas and porosity; studded weld is also successful. Arc weld with flux-coated electrode of 1/8" max. diam. gives low heat effect. Other electrodes are Cu, Monel, cast Fe. WB (7b)

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Welding at the International Association for Bridge and Structural Engineering. Berlin-Munich, Germany, Oct. 1936. *Welder*, Vol. 8, Dec. 1936, pp. 1160-1164. Summaries of some papers at the meeting are given. Fatigue testing and calculations for fatigue safety for weld design are discussed. Safety factors adopted for welded connections are on a par with those for riveted joints. Development of electrodes and use of high grade welding steel is noted. Residual stress, effect of type of weld and welding method in internal stresses, are reviewed. The thermally disturbed areas next to the weld are critically surveyed with suggestions of study to determine effect of type of current, electrode composition, diameter and cross section of structural members. Precautions are to remove disturbed areas out of highest stressed zones, grind weld smooth in some cases, standardization of welding equipment and methods. The idea that the old, traditional riveting can be replaced by cheap welding is untenable since welding is complicated art and requires constant supervision for success. Control of effects of shrinkage in internal stress, warping, etc., are considered as reduction of weld size, low-heat electrodes, sequence welding, speed of welding, reduction in number of layers in weld. Control in fillet welds is less favorable. Cracking of welds and factors favoring cracking are discussed and danger of cold hammering to reduce stress, shown to be applicable only to steels that do not tend to form microscopic cracks. Testing of welds by X-raying is briefly discussed. WB (7b)

Some Distribution in Irregular Sections Using Photo-elastic Models. T. V. MATTHEW. *J. Roy. Tech. Coll., Glasgow*, Vol. 4, Part I, Jan. 1937, pp. 121-134. Original research. The distribution of two-dimensional stress in welded joints and irregular sections is described using transparent models with photo-elastic properties. Comments made on the necessity for adequate allowances for high stress concentrations; the dangerous effect of irregularities in a stressed section in forming points of high stress concentration is also demonstrated, especially where sharp changes of shape occur, and the necessity for complete penetration stressed. Adequate fillets or flush finishing in welded joints is shown to be essential if a full development of the joint strength is to be obtained. JWD (7b)

What About Your Oxy-acetylene Regulator? E. L. MATHY (Victor Equipment Co.) *Ind. & Welding*, Vol. 10, Mar. 1937, pp. 23-27. Critical discussion of regulator faults and cure. 3 designs of regulators indicated as (1) delivery pressure drops with cylinder pressure (2) delivery pressure increases with lower cylinder pressure due to the seat being closed by means of the stream of high pressure gas, (3) two stage regulator where delivery pressure is constant as set. Due to creep of seat full pressure may be put on low pressure side and safety is in high strength diaphragm and pressure release to prevent hose or regulator failing. Spontaneous combustion in O cylinder is possible from oil or grease on seat or sudden rise in temperature due to rapid compression of residual O. Impact friction of particles in stream an auxiliary cause. WB (7b)

Autogenous Welding for Repairing and New Parts (Autogenschweissung bei Reparaturen und Neuherstellungen) W. RAABE. *Autogene*

Fire-proof...Explosion-proof...Collision-proof. R. S. ROBINSON. *Fab. Progress*, Dec. 1936, pp. 143-145. Descriptive. Gasoline tank trucks are discussed, as evolved by welding. Destruction tests of N. Y. City Bureau, by fire and dropping when filled with water were successfully passed by welded tank and truck bodies. Indications are that although severe deformations may take place, no leaks will occur, owing to ductility and strength of welds.

WB (7b)

Economics of Electric Welding. A. E. ROGERS. *Chem. Eng. Mining Rev.*, Vol. 29, Dec. 8, 1936, pp. 115-117. Factors are considered that influence the selection of equipment.

WHB (7b)

A New Oxy-acetylene Welding Method. F. E. ROGERS. *Ind. & Welding*, Vol. 10, Feb. 1937, pp. 24-25. French method of gas welding unchamfered plates set up with opening $\frac{1}{2}$ the plate thickness is described. Good properties and penetration were obtained with high welding speed.

WB (7b)

Weld Designs Good and Bad. BELA RONAY. *Welding Engr.*, Vol. 17, Jan. 1937, pp. 24-25. The use of more liberal included angle for chamfer of V welds is advocated for improving penetration to root of V. Lack of penetration to bottom of V is considered due to concentration of arc flame on sides of kerf because of bifurcated arc. Root spacing is required to be $1\frac{1}{2}$ times nominal diam. of rod. Additional safety is obtained by use of backing strip, removal and reweld of first layer.

WB (7b)

Spot- and Roller Seam Welding of Light Metals (Die Punkt- und Rollennahtschweissung von Leichtmetallen) F. ROSENBERG. *Aluminium*, Vol. 19, Feb. 1937, pp. 89-97. Resistance welding methods for Al and Al alloys are discussed and reviewed exhaustively, and the equipment, automatic and manual, described. In spot welding, the strength of the spot is superior to that of a rivet. 12 references.

Ha (7b)

Non-destructive Tests. E. C. ROLLASON. *W*

Permanency of Oxy-acetylene Welding. F. C. HUTCHINSON. *Welding Ind., London*, Vol. 4, Feb. 1936, pp. 10-12. Low maintenance labor, permanently leak-proof lines cited for welded pipe. WB (7b)

An Interesting Marine Boiler Repair. T. T. JACKSON. *Welding Ind., London*, Vol. 4, Sept. 1936, pp. 291-293. Details. WB (7b)

The Repair of Windlass Cylinder Castings. T. V. JACKSON. *Welding Ind., London*, Vol. 4, Nov. 1936, pp. 364-365. Descriptive, practical. WB (7b)

Welding in Colliery Maintenance. J. K. JOHANNESSEN. *Welding Ind., London*, Vol. 4, Jan. 1937, pp. 445-447. Repair welding discussed for heavy, cast equipment. WB (7b)

Welding in the Service of the Quarrying Industry. J. K. JOHANNESSEN. *Welding Ind., London*, Vol. 4, Apr. 1936, pp. 96-97. Discusses hardfacing. WB (7b)

Site Welding of Pressure Vessels. J. K. JOHANNESSEN. *Welding Ind., London*, Vol. 4, Oct. 1936, p. 326. Brief, with detailed sketch. WB (7b)

Repair of a Torn Shear Body of Steel by Autogenous Welding (Wiederherstellung eines zerrissenen Scheerenkörpers aus Stahl durch autogene Schweissung) H. H. GRIX. *Autogene Metallbearbeit.*, Vol. 30, Feb. 1, 1937, pp. 38-39. Describes procedure. Ha (7b)

Repairing of Aluminum Castings by Welding Processes. W. HERMANN & EDMUND R. THEWS. *Welding Ind., London*, Vol. 4, Apr. 1936, pp. 90-94. Details given. WB (7b)

Welding a Three-story Building. P. L. ROBERTS. *Welding Ind., London*, Vol. 4, Aug. 1936, pp. 275-278. Constructional details. WB (7b)

Manual Welding of Light Gauge Sheet Metal with the Carbon Arc—Apparatus and Technique. R. HARRIS &

Welded Stainless Steel in Notable Kitchens. EDWARD H. SYKES. *Welding Engr.*, Vol. 21, Dec. 1936, pp. 26-27. Photos of equipment. WB (7b)

The Construction of Automobile Chassis—Spot Welding at the Works of Vauxhall Motors Ltd. W. D. LAURIE. *Welding Ind., London*, Vol. 4, Mar. 1936, pp. 44-47. WB (7b)

Autogenous Welding (Soudure Autogène) LANGUEPIN. *Usine*, Vol. 46, Jan. 7, 1937, p. 31. The advantages of welded and cast base plates of machines are compared and application of welded structures in France and other countries briefly discussed. Ha (7b)

Lining Tanks with Stainless-clad Steel. W. B. KEELOR (Borg-Warner Corp.) *Welding Engr.*, Vol. 17, Jan. 1937, pp. 21-22. *Ind. & Welding*, Vol. 10, Feb. 1937, pp. 68-69. Details are given for lining riveted or butt welded tank with 16 gage 18-8 steel sheet by lap welding. WB (7b)

Welding of Alloy Steels. A. B. KINZEL. *Sheet Metal Ind.*, Vol. 10, Dec. 1936, pp. 971-972. Discusses the welding of the low-alloy, high-strength steels. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 219L/6. AWM (7b)

Welded Track Joints in Coal Mines. G. STUART JENKINS. *Proc. Illinois Mining Inst.*, 1936, pp. 80-81. The welding of track joints is described. Costs are 68¼ cents per joint as compared with \$1.004 for bonded joints. AHE (7b)

After Streamlining—the Modern Trend in Ship Construction and Repair. J. K. JOHANNESSEN. *Welding Ind., London*, Vol. 4, Aug. 1936, pp. 254-255. General. WB (7b)

Hardening Cast or Rolled Steel with the Oxyacetylene Flame. G. V. SLOTTMAN. *Welding Eng.*, Vol. 21, Dec. 1936, pp. 28-29. Practical. Methods, equipment and results obtained are briefly discussed and illustrated. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 212R/1.

8. FINISHING

H. S. RAWDON, SECTION EDITOR

Metal Finishing. *Steel*, Vol. 100, Jan. 4, 1937, pp. 296, 299, 301, 414-418. Gives opinions of various authorities on developments in the metal finishing industry during 1936. MS (8)

Cleaning and Finishing Buick Automotive Parts. J. B. NEALEY (Am. Gas Asso.) *Ind. Finishing*, Vol. 12, Nov. 1936, pp. 20, 22, 24. Automobile parts at the Flint plant of Buick Motor Co. that are to be sprayed with lacquer are first bonderized (essentially a phosphate treatment) and dried in gas ovens. A substitute process recently introduced known as "chromodine" is designed for parts subjected to bending after japanning. VSP (8)

8a. Pickling

Safe and Dangerous Inhibitors. ULICK R. EVANS. *Iron Age*, Vol. 137, Apr. 30, 1936, p. 44. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 174R/2. VSP (8a)

Inhibited Pickling Baths for Ferrous Components. P. MABB. *Blast Furnace Steel Plant*, Vol. 24, Aug. 1936, pp. 690-692. See *Metals & Alloys*, Vol. 7, Dec. 1936, p. MA 592L/6. MS (8a)

Use of Inhibitors in the Selective Removal of Metallic Coatings and Rust. S. G. CLARKE. *Iron Age*, Vol. 137, Apr. 30, 1936, pp. 43-44. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 160R/1. VSP (8a)

8b. Cleaning including Sand Blasting

Chemical Coloring of Metals (Chemische Färbung der Metalle) H. KRAUSE (Forsch. Inst. Edelmetalle) *Z. Ver. deut. Ing.*, Vol. 81, Jan. 30, 1937, pp. 127-13

9. TESTING

Temperature Measurements with the Disappearing-filament Optical Pyrometer. W. E. FORSYTHE. *Trans. Am. Inst. Mining Met. Engrs., Iron & Steel Division*, Vol. 120, 1936, pp. 171-188; discussion pages 202-216. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 162R/2. JLG (9)

A Simple Arrangement for the Measurement of Thermal and Electrical Conductivity (Eine einfache Anordnung zur Messung der Wärme- und elektrischen Leitfähigkeit) F. FÖRSTER (Kaiser Wilhelm Inst. Metallf., Stuttgart) *Z. Metallkunde*, Vol. 28, Nov. 1936, pp. 337-340. Descriptive. The thermal conductivity of an unknown sample is compared with that of a known sample by the use of one millivoltmeter. Specimens 7 cm. long by 1 cm. diam. are large enough and a temperature gradient of only 6° C. is required. An entire measurement can be made in 15 min. with an error of about 1%. The electrical conductivity of the same sample can be determined simultaneously. It is shown that the thermal conductivity of a 0.8 C steel, quenched and annealed at 680° C. remains constant while the electrical conductivity increases with time. GD (9)

The Examination of Colliery Wire Ropes in Service. M. A. HOGAN. *Iron & Coal Trades Rev.*, Vol. 134, Feb. 26, 1937, pp. 393-395. A report of 56 ropes investigated by the Rope Research Committee (British) is discussed with regard to causes of deterioration, detection of faults, and methods of testing while in service. Ropes used in mines to haul men are considered in particular. See *Metals and Alloys*, Vol. 7, Sept. 1936, p. MA 470R/3. Ha (9)

Optical Tests for the Metal Industry. R. PRUNSCH. *Iron & Steel Can.*, Vol. 19, Dec. 1936, pp. 5-13. Principles of testing by magnifying glass, illumination, microscope, spectrographic methods, apparatus and equipment, and evaluation of results are described. Ha (9)

9a. Inspection & Defects, including X-Ray Inspection

C. S. BARRETT, SECTION EDITOR

Proper Conditions for Radiography (Zweckmäßige Aufnahmebedingungen bei der Röntgendurchstrahlung) E. A. W. MÜLLER. *Arch. Eisenhüttenw.*, Vol. 10, Dec. 1936, pp. 267-273. The size

Fatigue Strength of Pinion Shafts (Dauerhaltbarkeit von Ritzelwellen) ERNST LEHR. *Z. Ver. Deut. Ing.*, Vol. 81, Jan. 30, 1937, pp. 117-118. Original research on the comparative fatigue strength under reversed flexure of pinion shafts in which the pinion teeth are cut in the shaft with no reduction of shaft at the inner end of the pinion teeth (the spaces milled between teeth have what in the U. S. are called "sled runner" ends), and pinion shafts in which there is a circumferential groove cut inside the pinion teeth reducing the diameter of the shaft to that at the root of the teeth. Detailed results of tests on several pinion shafts are given. The pinion shafts without reduction of diameter at the inside edges of the pinion teeth showed fatigue strength about 45% greater than the pinion shafts with such groove. The weakening effect of notches or scratches was also observed.

Ha + HFM (9c)

Machines for Locating Endurance Limit (Prüfmaschinen zur Ermittlung der Dauerfestigkeit) H. OSCHATZ. *Z. Ver. deut. Ing.*, Vol. 80, Nov. 28, 1936, pp. 1433-1439. Survey of equipment and technique. 29 references.

Ha (9c)

Failure of Heat-treated Steel Wire in Cables of the Mt. Hope, R. I., Suspension Bridge. W. H. SWANGER & G. F. WOHLGEMUTH. *Proc. Am. Soc. Testing Materials*, Vol. 36, Pt. II, 1936, pp. 21-75; discussion pp. 76-84. **Failure of Heat-treated Cable Wire.** IDEM. *Heat Treating Forging*, Vol. 22, Aug. 1936, pp. 391-393. **Studies Mt. Hope Suspension Bridge Cable Wire.** IDEM. *Steel*, Vol. 99, July 27, 1936, pp. 57-58. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 109R/6.

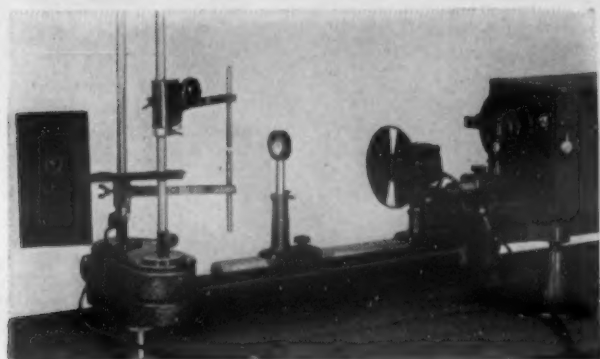
VVK + MS (9c)

9d. Magnetic Testing

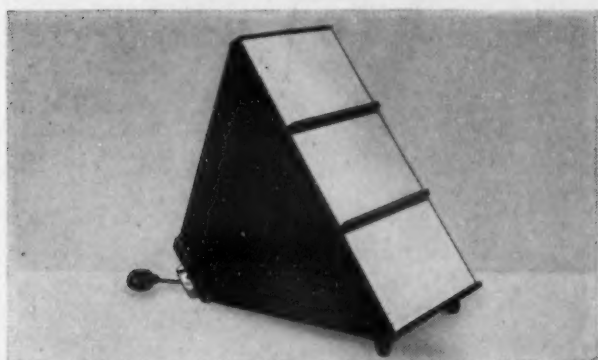
L. S. REID, SECTION EDITOR

Automatic Recording of Magnetization Curves (Selbsttätige Aufzeichnung von Magnetisierungskurven) W. STEINHAUS & E. SCHOEN. *Physik. Z.*, Vol. 38, Jan. 1, 1937, pp. 1-5. Describes in detail an apparatus which plots magnetization curves of all

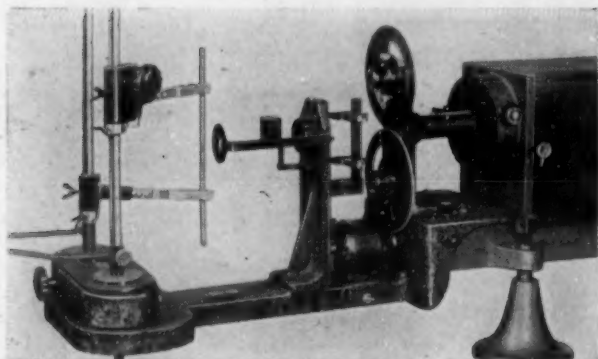
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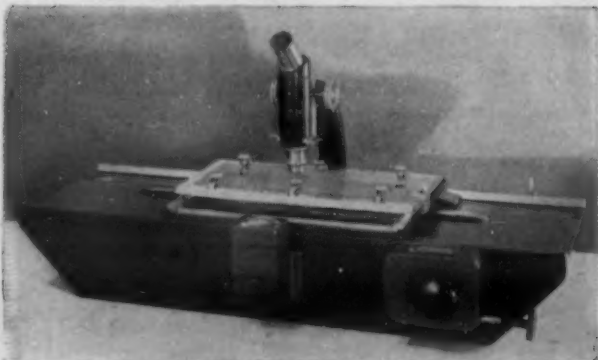
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*Herculoy TANK HELPS SOOTHE PARCHED THROATS



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The above illustration shows a 1400-gallon tank from which chilled drinking water will be supplied in the new building. The tank is made in two sections. The lower section is approximately six feet in diameter by 7 feet high and contains the water. Bolted to this is a top section approximately two feet high which contains a cooling coil connected to two Carrier ammonia machines. The entire tank is made of Revere Herculoy lined with block tin, and was fabricated by L. O. Koven & Brother, Inc., Jersey City, N. J., for Carrier Corporation, Newark, N. J.

Herculoy was chosen because of its well known characteristics of high resistance to corrosion and great

tensile strength. The tank was fabricated by welding, for which Revere Herculoy Welding Rod was used.

Because Revere Herculoy combines corrosion-resistance equivalent to that of pure copper, with mechanical strength comparable to that of steel, it is extremely useful for any purpose where both of these qualities are needed in one material. Obviously, it is especially applicable to chemical equipment.

Revere Technical Advisory Service is available for consultation regarding possible applications of Herculoy, or other Revere copper base alloys, in any chemical or process industry. The members of this service are especially trained to cooperate competently with your own engineers or consultants. For information please address our Executive Offices, 230 Park Avenue, New York City.

*U. S. Patent Nos. 1,868,679; 1,924,581; 2,002,460; 2,009,977.

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JULY, 1937

MA 453

Current News Items

Conference on Creep and Fatigue

A two-day conference on creep and fatigue of metals will be a feature of the special summer program and conferences on the strength of materials under the sponsorship of the Massachusetts Institute of Technology, Cambridge, Mass. The special conference on fatigue and creep is scheduled for July 15 and 16. The papers to be presented cover the various aspects of these subjects and present some of the problems experienced in certain industries. Dr. H. J. Gough of the National Physical Laboratory, England, will be a speaker. The program follows:

CREEP: 9:00 to 12:00 noon, July 15

Chairman, E. L. Robinson, General Electric Co.

INTRODUCTORY PAPER

H. J. French, International Nickel Co.

"THEORY OF CREEP" by A. Nadai, Westinghouse Electric & Mfg. Co.

"PROBLEMS OF TURBINE INDUSTRY" by C. R. Soderberg, Westinghouse Electric & Mfg. Co.

DISCUSSION

FATIGUE: 2:00 to 5:00 P.M., July 15

Chairman, John M. Lessells, Massachusetts Institute of Technology

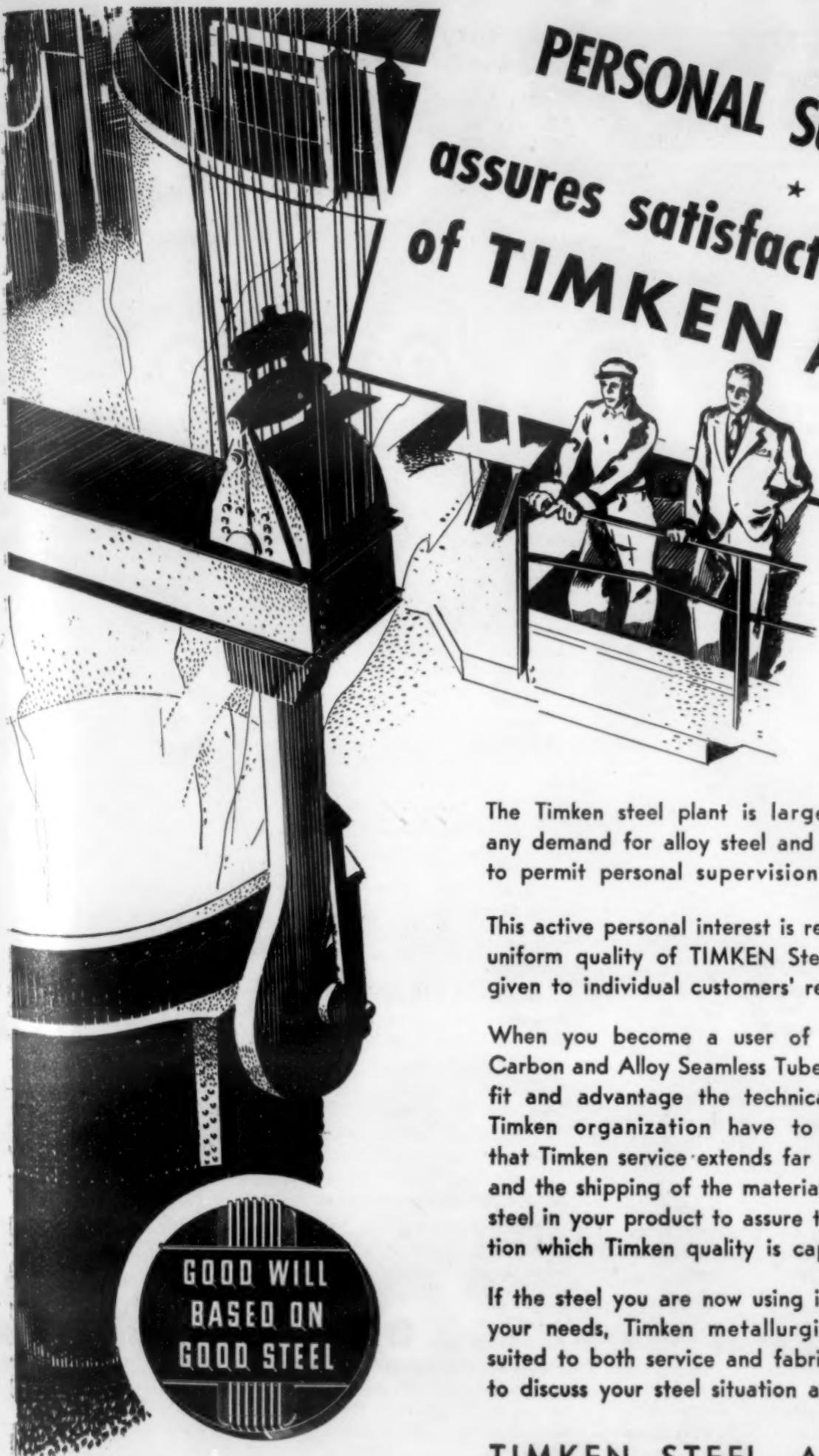
"EUROPEAN DEVELOPMENTS" by H. J. Gough, National Physical Laboratory, Teddington, England

"CORROSION FATIGUE" by D. J. McAdam, Jr., Bureau of Standards

"LIGHT ALLOYS" by R. L. Templin, Aluminum Co. of America

"STRUCTURAL PROBLEMS" by A. V. Karpov, Chairman, A.S.C.E. Committee on Fundamentals Controlling Structural Design

DISCUSSION



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If the steel you are now using is not the most suitable analysis for your needs, Timken metallurgists will suggest an analysis better suited to both service and fabrication requirements. We are ready to discuss your steel situation at any time.

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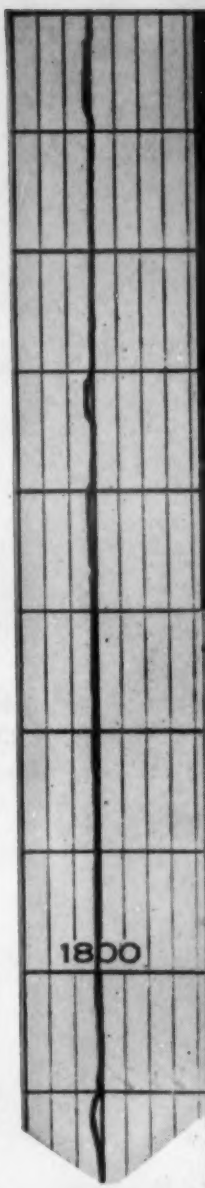
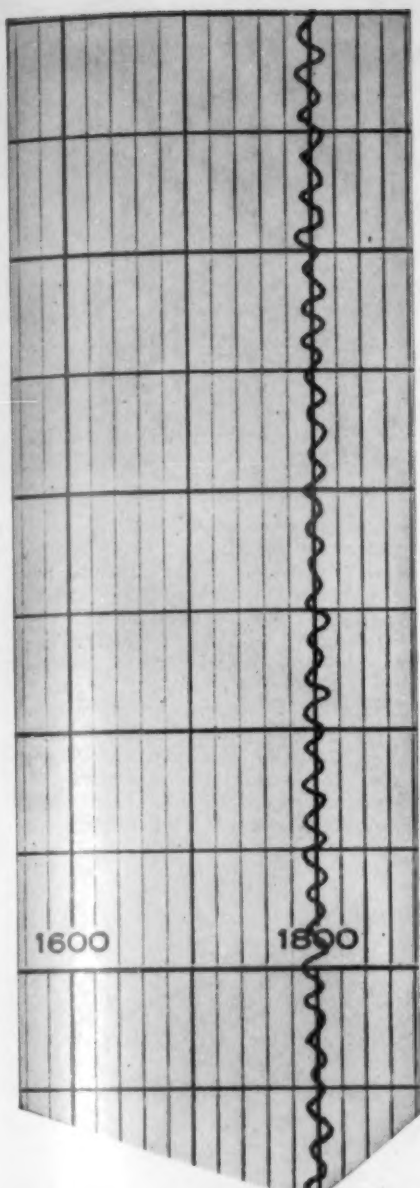
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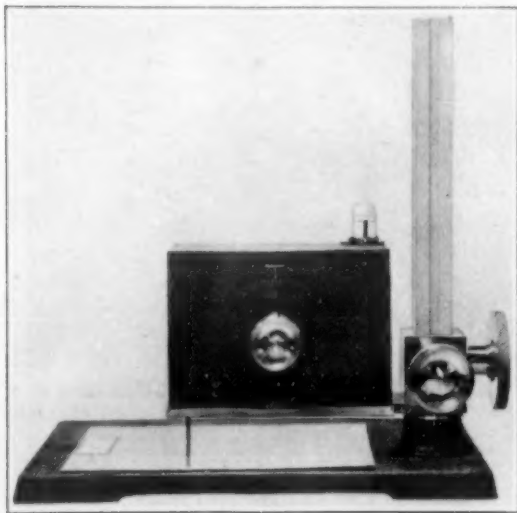
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JULY, 1937

New Equipment and Materials

Instrument for Measuring the Thickness of Nickel Coatings on Non-Magnetic Base Metals

The local thickness of an electroplated nickel coating on a non-magnetic base metal may be measured by a new instrument announced by the American Instrument Co., Silver Spring, Md. The principle of the method involves the measurement of the force required to detach one pole of a permanent magnet from the nickel coating, and the comparison of this force with



that required to detach the same magnet from a similar nickel coating of known thickness.

The instrument is calibrated with nickel coatings of known thickness which have been deposited under about the same conditions as the coatings to be tested. Nickel coatings deposited under different conditions have somewhat different magnetic permeabilities, but if such coatings are annealed at 400 deg. C. (750 deg. F.) they acquire about the same permeability, therefore the magnetic method is more reliable for annealed coatings than for coatings as deposited. Measurements on coatings as deposited are correct within ± 15 per cent, and on annealed coatings within ± 10 per cent.

The magnetic method is rapid and non-destructive and, for thin coatings, its accuracy approaches that of metallographic measurements. The metallographic method (in which the thickness of coatings is measured by means of a microscope and scale) requires experience and expensive equipment, and results in destruction of the specimen tested.

The sensitivity of this instrument can be varied by the proper selection of the spring, each division on the dial corresponding to approximately 0.00025 mm. (0.00001 in.) of nickel, so that the 100 divisions cover the range of thickness usually applied to non-ferrous metals. The reproducibility is about 3 per cent on coatings down to about 0.0005 mm. (0.00002 in.).

The new instrument is equally applicable to plane, convex and concave surfaces. The presence of the usual thin chromium coatings over the nickel has no appreciable effect on the thickness measurements, and is advantageous because it prevents oxidation of the nickel during annealing.

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